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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/837,503
Filing Date: April 18, 2001
Appellant(s): CALLAGHAN ET AL.

George A. Coury
For Appellant

SUPPLEMENTAL EXAMINER'S ANSWER

This is in response to the appeal brief filed January 15, 2009, appealing from the Office action mailed April 9, 2008, and the reply brief under 37 CFR 41.41 filed on July 6, 2009. A supplemental Examiner's Answer is set forth below.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the appeal brief.

(2) Related Appeals and Interferences

The Examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the appeal brief is correct.

(4) Status of Amendments After Final

The Appellant's statement of the status of amendments after final rejection contained in the appeal brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the appeal brief is substantially correct.

To reiterate, the "first conduit means" (claim 6, line 5) and the "second conduit means" (claim 6, line 9) do not invoke 35 U.S.C. 112, sixth paragraph. See Appellant's comments at the paragraph bridging pages 6 and 7 of the appeal brief.

To reiterate, the "water feed means" (claim 6, line 13) does invoke 35 U.S.C. 112, sixth paragraph. The "water feed means" is construed as corresponding to the elements specified at page 7, second paragraph, of the appeal brief, and equivalents thereof.

Regarding dependent claim 8, the Examiner considers the "means to atomize the water" to invoke 35 U.S.C. 112, sixth paragraph, because even though the phrase "means for" is not

specifically used, the claim limitation is written as a function to be performed and does not recite sufficient structure, material, or acts which would preclude the application of 35 U.S.C. 112, sixth paragraph. The Examiner, however, disagrees with Appellant's definition of said means as comprising, "the chamber 48, packing 50 within the chamber 48, and nozzle 52," (see page 8, last paragraph, of the appeal brief). As noted from the specification, the "means to atomize the water" only comprises the nozzle (Specification, page 6, lines 7-9: "It is preferred that the water be injected into the gas stream through a nozzle 52 which atomizes the water into small droplets."). The function of chamber 48 and packing 50 is to assist in the cooling of the reformed gas stream (Specification, page 6, lines 2-4). It is further noted that the chamber and packing are later claimed in dependent claims 9 and 10. Thus, the Examiner has construed the "means to atomize the water" as corresponding to a nozzle, and equivalents thereof.

(6) Grounds of Rejection to be Reviewed on Appeal

The Appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the Examiner.

Ground 2 – Whether claims 18, 2, 5, 7 and 11 are obvious over JP 62-283567 to Takeu (Hereafter Takeu) in view of JP 59-213940 to Hirota (Hereafter Hirota), Applicant's Disclosed Prior Art (hereafter ADPA) and US 4,264,566 to Giles et al. (Hereafter Giles).

Ground 3 – Whether claims 6 and 17 are obvious over Takeu in view of Hirota, ADPA, Giles

and Fanciullo.

Ground 4 – Whether claims 8-10 are obvious over Takeu in view of Hirota, ADPA, Giles and US 5,380,088 to Fleischli et al. (Hereafter Fleischli).

NEW GROUNDS OF REJECTION

In the following new grounds of rejection, the Examiner is no longer relying on Applicant's Disclosed Prior Art, or ADPA.

Ground 2' – Whether claims 18, 2, 5, 7 and 11 are obvious over JP 62-283567 to Takeu (Hereafter Takeu) in view of JP 59-213940 to Hirota (Hereafter Hirota) and US 4,264,566 to Giles et al. (Hereafter Giles).

Ground 3' – Whether claims 6 and 17 are obvious over Takeu in view of Hirota, Giles and Fanciullo.

Ground 4' – Whether claims 8-10 are obvious over Takeu in view of Hirota, Giles and US 5,380,088 to Fleischli et al. (Hereafter Fleischli).

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 6,458,478	Wang et al.	10-2002
US 4,046,956	Fanciullo	09-1977
JP 62-283567	Takeu	12-1987
JP 59-213940	Hirota	12-1984
US 4,264,566	Giles et al.	04-1981
US 5,380,088	Fleischli et al.	01-1995

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Ground 1

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 6,458,478) in view of Fanciullo (US 4,046,956).

Wang et al. (see FIGs. 1, 2 and 5; generally, column 4, line 33 to column 6, line 60; column 7, line 25 to column 8, line 59) discloses a fuel cell system comprising:
a fuel processor (i.e., reformer **10**) for converting a hydrocarbon fuel **1** into a reformed gas containing hydrogen, carbon dioxide and carbon monoxide;
first conduit means for communicating the reformed gas to a shift converter (i.e., a high temperature shift reactor **20**) located downstream of the fuel processor **10** for further

converting the reformed gas to a hydrogen and carbon dioxide containing gas stream;
second conduit means for communicating the gas stream to a fuel cell **50** downstream of the shift converter **20** for reacting the hydrogen in the gas stream;
a source of liquid phase water (i.e., water **200**, from the condensate of fuel cell **50**); and
water feed means (i.e., pumps **96, 98**; see FIG. 5; column 7, lines 42-50) for feeding liquid phase water from the source **200** to the first and second conduit means in a controlled manner, said water feed means being an equivalent to the means defined under 35 U.S.C. 112, sixth paragraph.

The apparatus of Wang et al. is the same as the instantly claimed apparatus, except that Wang et al. is silent as to the apparatus further comprising at least one selective oxidizer, between the shift converter **20** and the fuel cell **50**, and located downstream of where the water feed means **96,98** feeds water to the second conduit means.

Fanciullo (FIG. 1) teaches a fuel cell system comprising a fuel processor (i.e., reformer **17**), a shift converter **28** and a fuel cell **10**. Fanciullo further teaches at least one selective oxidizer **32**, provided between the shift converter **28** and the fuel cell **10**. In the "Description of the Prior Art", Fanciullo evidences that the above stated elements as well as their particular arrangement is conventional to fuel cell systems (see column 1, lines 10-35).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to further provide at least one selective oxidizer at the recited location between the shift converter **20** and the fuel cell **50** in the apparatus of Wang et al., on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because the provision of a selective oxidizer further decreases the carbon monoxide content of a reformed gas stream to a

tolerable level for use by a fuel cell. The reduction in carbon monoxide minimizes the poisoning of a fuel cell, which is desirable in cases where long life is an important criterion, as taught by Fanciullo (see column 1, lines 27-35).

Ground 2'

Claims 18, 2, 5, 7 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeu (JP 62-283567) in view of Hirota (JP 59-213940) and Giles et al. (US 4,264,566).

Regarding claim 18, Takeu (FIG. 1; English Abstract; Translation) discloses a fuel cell system, comprising: a fuel processor (i.e., reformer **8**) for producing a reformed gas; a shift converter (i.e., a high temperature shift converter **9**) located downstream of the fuel processor **8**; a fuel cell **1** downstream of the shift converter **9**; a first conduit connecting the fuel processor **8** to the shift converter **9** for carrying the reformed gas to the shift converter; and a second conduit connecting the shift converter **9** with the fuel cell **1** for carrying the gas stream to the fuel cell.

Takeu further discloses a source of water in the form of steam **7**, and a unit for feeding the water in a controlled manner (i.e., by manipulation of valves **13, 14, 15, 16**) from the source **7** to at least one of the first and second conduits (i.e., via pipes **11** and **12**). (see also, translation page 5, line 10 to page 6, line 15, regarding manipulation of the valves).

Although Takeu discloses that the source of water comprises steam and not a liquid phase water, the recitation of a particular phase of water adds no further patentable weight to the apparatus claim, since expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim, *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969). Also, the inclusion of a material worked upon by a structure being claimed does not impart patentability to the claims, *In re Young*, 75 F.2d

966, 25 USPQ 69 (CCPA 1935); *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963).

In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute a source of liquid phase water for the steam in the apparatus of Takeu, on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because the use of liquid phase water as an alternative to steam for providing the same function in reducing the carbon monoxide in the reformed gas stream would have been considered conventional to one of ordinary skill in the art, as evidenced by Hirota (i.e., liquid phase water from tank **15** is fed to conduit **20b** located between fuel processor **1d** and shift converter **24**; see Figure and Abstract). Furthermore, the substitution of known equivalents merely involves routine skill in the art.

Takeu is silent as to the unit for feeding water comprising the specifically claimed water feed control unit, where the control unit includes a sensor for sensing the temperature of the at least one of the reformed gas and gas stream, a valve for adjusting the flow rate of water into the at least one of the reformed gas and the gas stream, and a control unit for controlling the valve based upon temperature sensed by the sensor.

However, Giles et al. (FIG. 2; column 5, line 35 to column 7, line 64) teaches an apparatus comprising a conventional control system, said apparatus comprising a sequence of catalyst beds **1-4** each connected by conduits **62, 65, 69**, wherein a cold feed gas is supplied to each of the conduits in a controlled manner. In particular, the apparatus comprises a feed control unit including a sensor for sensing the temperature of at least one of the effluent streams within the conduits (i.e., thermocouple, generating signals **121, 131, 141**); a valve **130, 140, 150** for adjusting the flow rate of feed gas into the at least one of the effluent streams, and a control unit

124, 134, 144 for controlling the valve based upon the temperature sensed by the sensor.

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the instantly claimed water feed control unit in the apparatus of Takeu, on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because such a control system would enable a close control of the temperature within the apparatus, with minimal measurement time lag, as taught by Giles et al. (see, e.g., column 2, lines 16-38).

Regarding claim 2, the modified apparatus of Takeu structurally meets the claim because the amount of water added and the particular oxygen/carbon ratio fed to the shift converter **9** are considered process limitations that add no further structure to the apparatus claim.

Regarding claim 5, Takeu is silent as to the apparatus further comprising means for collecting water from the fuel cell **1** and recycling at least a portion of the collected water to the water source **7**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide means for collecting and recycling water from the fuel cell **1** to the water source **7** in the apparatus of Takeu, on the basis of suitability for the intended use thereof, because the Examiner takes Official Notice that it is well known in the art to collect and recycle unused reactants and products for subsequent use within the apparatus, for raw material conservation. This conventionally known concept is further evidenced by Hirota, who teaches a system comprising means for collecting and recycling water produced by a fuel cell **7** to a water source **15**, for subsequent use (see FIG. 3, 4).

Regarding claim 7, "solenoid valves" are not specifically disclosed. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made

to select solenoid valves for the control valves in the modified apparatus of Takeu, on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because the Examiner takes Official Notice that the use of solenoid valves as control valves is well known in the art.

Regarding claim 11, Takeu discloses that water is fed to both the first conduit and the second conduit, via lines **11** and **12** (see Figure 1).

Ground 3'

Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeu (JP 62-283567) in view of Hirota (JP 59-213940) and Giles et al. (US 4,264,566), as applied to claim 18 above, and further in view of Fanciullo (US 4,046,956).

The same comments with respect to Takeu, Hirota and Giles et al. apply. Furthermore, the water feed control unit in the modified apparatus of Takeu is considered an equivalent to the water feed means under 35 U.S.C. 112, sixth paragraph. Takeu, however, is silent as to the apparatus further comprising at least one selective oxidizer, between the shift converter **9** and the fuel cell **1**, and located downstream of where the water feed control unit feeds water to the second conduit means. Fanciullo (FIG. 1) teaches a fuel cell system comprising a fuel processor (i.e., reformer **17**), a shift converter **28** and a fuel cell **10**. Fanciullo further teaches at least one selective oxidizer **32**, provided between the shift converter **28** and the fuel cell **10**. In the "Description of the Prior Art", Fanciullo evidences that the above stated elements as well as their particular arrangement is conventional to fuel cell systems (see column 1, lines 10-35). It would have been obvious for one of ordinary skill in the art at the time the invention was made to further provide at least one selective oxidizer at the recited location between the shift converter **9**

and the fuel cell **1** in the modified apparatus of Takeu, on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because the provision of a selective oxidizer further decreases the carbon monoxide content of a reformed gas stream to a tolerable level for use by a fuel cell. The reduction in carbon monoxide minimizes the poisoning of a fuel cell, which is desirable in cases where long life is an important criterion, as taught by Fanciullo (see column 1, lines 27-35).

Ground 4'

Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeu (JP 62-283567) in view of Hirota (JP 59-213940) and Giles et al. (US 4,264,566), as applied to claim 18 above, and further in view of Fleischli et al. (US 5,380,088).

Takeu is silent as to the water feed control unit comprising a mixer device including a means to atomize the water and a packing of high surface area material. Fleischli et al. (see FIGs. 1), however, teaches a mixer device including a means to atomize a fluid (i.e., an injection system **3**) and a packing of high surface area material (i.e., static mixing unit **4**), wherein the material comprises a honeycomb monolith (i.e., defined by corrugated layers **11**, see FIG. 2). It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the mixer device of Fleischli in the modified apparatus of Takeu, on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because the mixer device of Fleischli et al. is a simple device that provides intimate mixing over the entire cross section of a channel, and over short sections, while maintaining a small pressure drop (see column 2, lines 38-46). The injection system is considered an equivalent to the "means to atomize the water" under 35 U.S.C. 112, sixth paragraph.

(10) Response to Argument

Ground 1

Appellant (see appeal brief: paragraph bridging pages 10 and 11) argues,

“... The Examiner further reasons that one having skill in the art would know to put the selective oxidizer of Fanciullo downstream of both of the shift convertors of Wang. It is not clear what teaching support this conclusion, and this the positioning of Fanciullo's selective oxidizer downstream of a shift convertor, when there are two shift convertors as in Wang, seems to not be a clear teaching of either position. Further, these ambiguous locations resulting from efforts to combine the teachings of Fanciullo and Wang result in various locations, at least some of which do not correspond to the instant claims. It is submitted that it would not at all be obvious to place the selective oxidizer where located according to the present application, and further that the location in the present application serves the stated purpose of the invention as recited in the specification, while no such purpose or motive for such placement is stated in either Wang et al. or Fanciullo. The present specification teaches that this placement of the selective oxidizer is so that any remaining carbon monoxide in the gas stream can be further reduced prior to feeding the gas stream to the fuel cell. If not fed downstream of the water injection point, then reduction would not be as likely to occur as is taught and desired in accord with the present invention. Since this location is for a specific purpose, and it is not at all taught or suggested by any of the art of record, it is submitted that claim 6 is allowable over the art of record...”

The Examiner respectfully disagrees.

The primary reference to Wang et al. (see FIGs. 1, 2 and 5) discloses a fuel cell system comprising a fuel processor (i.e., reformer **10**), a shift conversion zone including a high temperature shift converter **20** and a low temperature shift converter **22**, and a fuel cell **50** to which the hydrogen containing stream is ultimately fed. Wang et al., however, fails to disclose

the claimed placement of “at least one selective oxidizer”.

The secondary reference to Fanciullo (FIG. 1) teaches a fuel cell system comprising a fuel processor (i.e., reformer **17**), a shift converter **28** and a fuel cell **10**. In particular, Fanciullo teaches at least one selective oxidizer **32**, provided between the shift converter **28** and the fuel cell **10**. In the “Description of the Prior Art”, Fanciullo teaches that the above stated elements, as well as the specific arrangement of a shift converter downstream from a fuel processor, and a selective oxidizer downstream from the shift converter, are conventionally employed in fuel cell systems to reduce the final carbon monoxide content in the reformed gas stream to a tolerable level for processing in the fuel cell. Shift conversion, alone, would be insufficient for reducing the carbon monoxide in the reformed gas stream to the low levels, i.e., about 0.1% carbon monoxide, required for maintaining a long life in the fuel cell. (see column 1, lines 10-35).

It is noted that Fanciullo’s reason for providing a selective oxidizer is the same as Appellant’s reason (i.e., “...so that any remaining carbon monoxide in the gas stream can be further reduced prior to feeding the gas stream to the fuel cell.”).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to similarly position at least one selective oxidizer between the shift conversion zone (i.e., after the final shift converter **22**) and the fuel cell **50** in the apparatus of Wang et al., so that the carbon monoxide content in the final reformed gas stream may be further reduced in order to maintain a long life in the fuel cell **50**, as taught by Fanciullo. Furthermore, because the water injection points (i.e., from sources **200**) are located immediately upstream of the high temperature shift converter **20** and immediately upstream of the low temperature shift converter **22** in the apparatus of Wang et al., it then follows that the selective oxidizer would be located

downstream from both water injection points (i.e., “downstream of where the water feed means feeds water to the second conduit means”) in the modified apparatus.

The positioning of the at least one selective oxidizer at such location would not be considered unclear or “ambiguous” by one of ordinary skill in the art, because it is clear from the teachings of Fanciullo that selective oxidation should occur after shift conversion, as a final chemical measure for reducing the carbon monoxide content of a reformed gas stream, prior to its supply to a fuel cell.

Ground 2’

Appellant (see appeal brief: page 11, last paragraph; see also reply brief: page 1, last paragraph, to page 2, first paragraph) argues,

“Turning to claim 18, this claim calls for the water injection means to inject liquid phase water. The Examiner concedes that Takeu (the primary reference used to reject claim 18) does not at all disclose this subject matter. Instead, Takeu discloses a very different injection of steam, or vapor phase water. This is critically different in that the water is much more effective to cool when it is introduced in liquid phase. It is submitted that this claim limitation is in fact properly given weight in the present claim, and further that there are surprising results in using liquid phase water. The teaching of liquid phase water in other prior art patents which have been used as secondary prior art should not be seen as evidence that a person of skill in the art would make such a modification. The Examiner paraphrases the reasons from the present specification as to why liquid phase water is desired and then relies upon these reasons to conclude that this subject matter is obvious based upon the teachings of Takeu.”

The Examiner respectfully disagrees.

Firstly, although Takeu discloses that the source of water comprises steam and not a “liquid phase water”, the Examiner maintains that the recitation of a particular phase of water

adds no further patentable weight to the apparatus claim, since expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim, and the inclusion of a material worked upon by a structure being claimed does not impart patentability to the claims. See MPEP 2115.

Secondly, even if patentable weight were given to a specific phase of water, the Examiner maintains that it would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute a source of liquid phase water for the steam in the apparatus of Takeu, on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because the use of liquid phase water, as an alternative to steam, for providing the same function in reducing the carbon monoxide content in a reformed gas stream, would have been considered conventional to one of ordinary skill in the art, as evidenced by Hirota (i.e., liquid phase water from tank **15** is fed to conduit **20b** located between fuel processor **1d** and shift converter **24**; see Figure and Abstract).

Lastly, Appellant argues “surprising results in using liquid phase water”, and that “water is much more effective to cool when it is introduced in liquid phase.” However, the more effective cooling would not be considered surprising or unexpected. Under atmospheric pressure, water is a liquid at its melting point to about 100 °C, and water is a vapor/steam at greater than 100 °C. Predictably, water admitted to the conduits at a lower temperature will cool the reformed gas stream more effectively than water admitted to the conduits at a higher temperature. Please note that the Examiner is not “paraphrasing” from Appellant’s present specification. Rather, the Examiner is merely stating knowledge that would have been well known to those having ordinary skill in the art.

Appellant (see appeal brief: page 12, second paragraph) further argues,

“... the Examiner turns to Applicant's "Disclosed Prior Art", which teaches that such control systems themselves are known in the art. The use of such control systems in the present invention is not at all disclosed or suggested by ADPA or any other art of record, and claim 18 should be allowed. All that is stated in the portion of the specification cited by the Examiner is that the actual components for this type of control are known to persons skilled in the art. Clearly, there is no teaching at all from any art of record to incorporate such components into the system of the present invention.”

Appellant's argument has been fully considered, but it is now moot in view of the new grounds of rejection, which removes Appellant's "Disclosed Prior Art" from the rejection.

Appellant (reply brief: page 2, third paragraph, to page 3, first paragraph) further argues,

“Giles was cited as teaching a control unit in a catalyst bed system. Because of the different environment of use and the lack of teaching in either reference that such a system would be useful in a fuel cell power plant, it is submitted that this prior art teaches nothing more than had been asserted as taught in the earlier relied upon ADPA. Giles confirms that flow control systems based upon temperature measurements exist, in other and very different fields of use.

Appellants contend that neither Takeo nor Giles contains any teaching which would lead a person skilled in the art to expect that beneficial results could be obtained by using the flow control system of Giles in Takeo. The use of such control systems as claimed in the present application is different from each of Takeo and Giles. Takeo does not disclose or suggest a flow control member for controlling the injection of steam as contemplated therein. Giles does not disclose anything which would lead the person of skill in the art to believe that Giles contains any relevant teachings. It is submitted, in fact, that Giles is from a different field of endeavor, and directed to a different problem to be solved than Takeo or the claimed invention. Therefore, it is submitted that a person skilled in the art would not consult Giles when considering systems such as that of the present claims, and further that if such skilled artisan did consult Giles, there would be no

expectation that the Giles control system could be successfully incorporated into the system of Takeo.”

The Examiner respectfully disagrees.

It has been held that a prior art reference must either be in the field of Appellant’s endeavor or, if not, then be reasonably pertinent to the particular problem with which the Appellant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See MPEP 2141.01(a).

In this case, the Examiner asserts that the prior art to Takeu and Giles would have been considered to be analogous art, because both Takeu and Giles were concerned with the same particular problem of controlling the temperature rise in a series of catalyst beds.

In Takeu, the apparatus is provided with temperature transmitters **19** and **20** (location not shown), control valves **13** and **14**, automatic shut off valves **14** and **16**, and a controlling computer (not shown). The elements cooperate to control the supply of steam to the piping between the series of catalyst beds (i.e., in reactors **8**, **9** and **10**), so as to control the temperature rise and prevent an overheating of the devices. (see FIG. 1; English Translation: page 5, second to last paragraph, to page 6, second paragraph).

The apparatus of Giles is structurally and functionally similar to the apparatus of Takeu. Giles et al. (FIG. 2; column 5, line 35 to column 7, line 64) teaches an apparatus comprising a control system, said apparatus comprising a sequence of catalyst beds **1-4** each connected by conduits **62**, **65**, **69**, wherein a cold feed gas is supplied to each of the conduits in a controlled manner. In particular, the control system comprises a feed control unit including a sensor for sensing the temperature of at least one of the effluent streams within the conduits (i.e.,

thermocouple, generating signals **121, 131, 141**); a valve **130, 140, 150** for adjusting the flow rate of feed gas into the at least one of the effluent streams, and a control unit **124, 134, 144** for controlling the valve based upon the temperature sensed by the sensor. The elements cooperate to control the supply of cold feed gas to the piping between the series of catalyst beds, so as to maintain a lowest stable operating temperature of the reactor (see Abstract).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the claimed water feed control unit in the apparatus of Takeu, because such a control system would have enabled a close control of the temperature within the apparatus, with minimal measurement time lag, as taught by Giles et al. (see, e.g., column 2, lines 16-38).

If a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. One must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.

Ground 3'

Appellant (see appeal brief: page 12, second to last paragraph; see also reply brief: page 3, second paragraph) argues,

“... The same reasoning supporting reversal of the rejection of claim 6 in Ground 1 applies here. The combination of art does not at all suggest the placement of the selective oxidizer relative to the water injection point.”

The Examiner respectfully disagrees.

The primary reference to Takeu (see FIG. 1) discloses a fuel cell system comprising a fuel processor (i.e., reformer **8**), a shift conversion zone including a high temperature shift

converter **9** and a low temperature shift converter **10**, and a fuel cell **1** to which the hydrogen containing stream is ultimately fed. Takeu, however, fails to disclose the claimed placement of “at least one selective oxidizer”.

The secondary reference to Fanciullo (FIG. 1) teaches a fuel cell system comprising a fuel processor (i.e., reformer **17**), a shift converter **28** and a fuel cell **10**. In particular, Fanciullo teaches at least one selective oxidizer **32**, provided between the shift converter **28** and the fuel cell **10**. In the “Description of the Prior Art”, Fanciullo teaches that the above stated elements, as well as the specific arrangement of a shift converter downstream from a fuel processor, and a selective oxidizer downstream from the shift converter, are conventionally employed in fuel cell systems to reduce the final carbon monoxide content in the reformed gas stream to a tolerable level for processing in the fuel cell. Shift conversion, alone, would be insufficient for reducing the carbon monoxide in the reformed gas stream to the low levels, i.e., about 0.1% carbon monoxide, required for maintaining a long life in the fuel cell. (see column 1, lines 10-35).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to similarly position at least one selective oxidizer between the shift conversion zone (i.e., after the final shift converter **10**) and the fuel cell **1** in the modified apparatus of Takeu, so that the carbon monoxide content in the final reformed gas stream may be further reduced in order to maintain a long life in the fuel cell **1**, as taught by Fanciullo. Furthermore, because the water injection points are located immediately upstream of the high temperature shift converter **9** and immediately upstream of the low temperature shift converter **10** in the apparatus of Takeu, it then follows that the selective oxidizer would be located downstream from both water injection points (i.e., “downstream of where the water feed means feeds water to the second conduit

means”) in the modified apparatus.

The positioning of the at least one selective oxidizer at such location would not be considered unclear or “ambiguous” by one of ordinary skill in the art, because it is clear from the teachings of Fanciullo that selective oxidation should occur after shift conversion, as a final chemical measure for reducing the carbon monoxide content of a reformed gas stream, prior to its supply to a fuel cell.

Ground 4’

Appellant (see appeal brief: paragraph bridging pages 12 and 13; see also reply brief: page 3, last paragraph) argues,

“While Fleischli may teach a structure which atomizes a stream of liquid, it is submitted that nothing in the art of record would lead a person of skill in the art to combine this structure into the water feed zone of the present claims, and therefore that this rejection is not proper under 35 USC 103 and should be reversed.”

Appellant’s argument is not found persuasive, since Appellant has not provided any reasoning or evidence as to why one of ordinary skill in the art would not have been motivated to make the modification. As noted in the rejection, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the mixer device of Fleischli in the modified apparatus of Takeu, because the mixer device is a simple device that provides intimate mixing over the entire cross section of a channel, and over short sections, while maintaining a small pressure drop (see column 2, lines 38-46).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner’s answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Jennifer A. Leung/
Primary Examiner, Art Unit 1797

Appellant may file another reply brief in compliance with 37 CFR 41.41 within two months of the date of mailing of this supplemental examiner's answer. Extensions of time under 37 CFR 1.136(a) are not applicable to this two month time period. See 37 CFR 41.43(b)-(c).

A Technology Center Director or designee has approved this supplemental examiner's answer by signing below:

/Christopher A. Fiorilla/
Chris Fiorilla
Supervisory Patent Examiner, Art Unit 1700

Conferees:

/Christopher A. Fiorilla/
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/Glenn A. Caldarola/
Acting SPE of Art Unit 1797

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